

**NATURAL RESOURCES CONSERVATION SERVICE**  
**VIRGINIA CONSERVATION PRACTICE STANDARD**  
**RESIDUE MANAGEMENT, NO-TILL/STRIP-TILL**

(Acre)

**CODE 329A**

**DEFINITION**

Managing the amount, orientation and distribution of crop and other plant residues on the soil surface year-round, while growing crops in narrow slots, or tilled or residue free strips in soil previously untilled by full-width inversion implements.

The soil is left undisturbed from harvest through planting, except for strips up to 1/3 of the row width (strips may involve only residue disturbance or may include soil disturbance). Planting or drilling is accomplished using disk openers, coulter(s), row cleaners, in-row chisels, or rototillers. Weed control is accomplished primarily with crop protection products. Cultivation may be used for emergency weed control. Other terms used include direct seeding, slot planting, zero-till, row-till, and slot-till.

**PURPOSES**

This practice may be applied as part of a conservation management system to support one or more of the following:

- Reduce sheet and rill erosion.
- Reduce wind erosion.
- Maintain or improve soil organic matter content.
- Conserve soil moisture.
- Provide food and escape cover for wildlife.

**CONDITIONS WHERE PRACTICE APPLIES**

This practice applies to all cropland and other land where crops are grown.

**CRITERIA**

**GENERAL CRITERIA APPLICABLE TO ALL PURPOSES NAMED ABOVE**

Loose residues to be retained on the field shall be uniformly distributed on the soil surface. Where combines or similar machines are used for harvesting, they shall be equipped with spreaders capable of distributing residue over at least 80 percent of the working width of the header.

Planters or drills shall be equipped to plant directly through untilled residue or in a tilled seedbed prepared in a narrow strip along each row by planter attachments such as rotary tillers, sweeps, multiple coulters, or row cleaning devices.

Residues shall not be burned, or disturbed by full-width tillage operations except as follows:

- Seedbed preparation, planting, and fertilizer placement shall disturb no more than one third of the row width. The row area formed by the planting operation shall be level with or slightly above the adjacent row middles unless the rows are planted on the contour.

Conservation practice standards are reviewed periodically, and updated as needed. To obtain the current version of this standard, contact the Natural Resources Conservation Service.

- If row cultivation or spot treatment for weed escapes, leveling ruts, or similar operations become necessary, tillage shall be limited to undercutting operations which minimize burial of surface residue.

#### **ADDITIONAL CRITERIA TO REDUCE SHEET AND RILL EROSION**

The amount of randomly distributed, flat residue needed to reduce erosion within the soil loss tolerance (T), or any other planned soil loss objective, shall be determined using current approved erosion prediction technology. Partial removal of residue by means such as baling or grazing shall be limited in order to retain the amount needed. Calculations shall account for the effects of other practices in the conservation management system.

#### **ADDITIONAL CRITERIA TO REDUCE WIND EROSION**

The amount and orientation of residue needed to reduce erosion within the soil loss tolerance (T), or other planned soil loss objective, shall be determined using current approved wind erosion prediction technology. Partial removal of residue by means such as baling or grazing shall be limited in order to retain the amount needed. Calculations shall account for the effects of other practices in the conservation management system.

#### **ADDITIONAL CRITERIA TO MAINTAIN OR IMPROVE SOIL ORGANIC MATTER CONTENT**

The amount of residue needed to achieve the desired soil condition, shall be determined using the current approved soil conditioning index procedure. Partial removal of residue by means such as baling or grazing shall be limited in order to retain the amount needed. Calculations shall account for the effects of other practices in the conservation management system.

#### **ADDITIONAL CRITERIA TO CONSERVE SOIL MOISTURE**

A minimum quantity of 50 percent residue cover shall be maintained throughout the year. Residue shall be evenly distributed and maintained on the soil surface. Partial removal of residue by means such as baling or grazing shall be limited in order to retain the amount needed.

#### **ADDITIONAL CRITERIA TO PROVIDE FOOD AND ESCAPE COVER FOR WILDLIFE**

Residue height, amount, and time period shall be determined using an approved habitat evaluation procedure. Residues shall not be removed unless it is determined by the habitat evaluation procedure that removal would not adversely affect habitat values.

### **CONSIDERATIONS**

No-till or strip-till may be practiced continuously throughout the crop sequence, or may be managed as part of a system which includes other tillage and planting methods such as mulch-till.

Production of adequate amounts of crop residues necessary for the proper functioning of this practice can be enhanced by selection of high residue producing crops and crop varieties in the rotation, use of cover crops, and adjustment of plant populations and row spacings.

Allowing cover crops to grow to or near maturity will provide more residue and will also slow the rate of residue decomposition.

Standing residue permits easier planting. Set combine headers as high as possible. Also, the use of stripper headers will leave more standing residue.

If the residue has been shredded, determine that the planting equipment can cut through the residue to achieve the desired seed to soil contact.

When properly used, long-term residue management practices will effectively reduce soil erosion caused by water and wind. These practices can reduce soil erosion to 0-20% of that occurring under moldboard plowing and other conventional tillage systems.

All of the benefits of residue management do not occur the first year. Under most conditions, the soil organic matter and additional soil quality improvements (such as the presence of earthworms) do not occur until the third year or later, and thereafter.

Long-term residue management permits the increase of soil organic matter and therefore reduces the release of carbon gases to the atmosphere, a contributor to global warming.

The amount of organic matter in Virginia soils is small, but its influence on soil properties can be large. To maximize soil organic matter improvement, all tillage (including light disking) must be eliminated.

When no-till is practiced continuously, soil reconsolidation provides additional resistance to sheet and rill erosion.

Burndown herbicides applied at least 2 weeks prior to planting the next crop will kill the cover crop, weeds, and other vegetation that may compete with the crop and deplete the soil moisture necessary for crop germination and early plant growth.

The soil adaptability for the conservation tillage types being evaluated should be considered. As an example, no-till may not be a good choice on poorly drained soils.

Early spring planting should be delayed until the desired soil temperature is obtained.

There may be a need for other conservation practices, in conjunction with conservation tillage. This should be considered during the planning process. For example, consider the need for grassed waterways where erosion by concentrated flow is a problem. Terraces may be used to reduce the sheet and rill erosion to the required level.

The pH and fertility levels should be maintained as prescribed by a soil test. Long term no-till can have a major impact on the pH and fertility levels at various depths.

Surface applications of fertilizer and lime without incorporation can adequately maintain soil fertility and pH levels in long-term residue management systems. Also, long-term no-till neutralizes acidity to greater depths in the soil.

Seed varieties should be used which have good cold tolerance, fast germination, and early seedling vigor.

Recommend appropriate measures to suppress or eliminate hard to control weeds such as Johnsongrass and bermudagrass before implementing a conservation tillage program.

Care should be taken to consider the crop rotation when utilizing chemical control in no-till situations.

When no-till is practiced continuously, soil crusting may be eliminated.

Encourage the use of no-till to maintain food and cover for wildlife.

Leaving rows of unharvested crop standing at intervals across the field can enhance the value of residues for wildlife habitat.

Residue management provides many benefits to game and non-game species of wildlife. Among the benefits are: (1) providing food above the soil surface; (2) providing cover for nesting; (3) reducing nest destruction; (4) providing protective winter cover; (5) reducing sedimentation losses and the transport of agricultural chemicals; and (6) dilution of predator pressure.

Crop rotation of all crops (including cover crops) is needed to aid in pest control. Follow proper soil testing, nutrient management, Integrated Crop Management (ICM), and Integrated Pest Management (IPM) techniques.

## PLANS AND SPECIFICATIONS

Specifications for this practice shall be in accordance with the stated criteria and recorded in the conservation plan case file. Plans and specifications are to be prepared for specific field sites based on this standard. Additional practice information will be documented on the "Conservation Practice Physical Effect Worksheet" for the Virginia Conservation Practice Standard *Residue Management, No-Till/Strip-Till (Code 329A)* and the Conservation Practice Job Sheet.

A Residue Management plan will be developed for all fields that utilize no-till and/or strip-till. The management of the no-till/strip-till system will be documented in the conservation plan.

The conservation plan shall include the following information:

1. Identify resources concern(s) to be treated.
2. Ensure that field location, acreage, crop rotation, tillage sequence, and percent residue needed to address the identified resource concern(s) are recorded as needed.

#### **NO-TILL**

It is considered no-till when the crop is planted in undisturbed soil, with at least 60 percent of the soil surface covered by crop residue after planting. The soil is left undisturbed from harvest to planting except for nutrient injection and/or seeding of cover crops. See the Virginia Conservation Practice Standard, *Cover Crop (340)*.

Crop residue is left on the surface from the prior crop. It may be shredded in the fall, winter or spring prior to planting or may be left unshredded. If the current crop residue is to be used (harvested), or it is not adequate to provide the needed cover, a cover crop can be used to provide the needed cover.

The seedbed, usually 1 to 3 inches wide, is prepared by breaking the soil with a coulters, single chisel, or similar tool. Seedbed preparation and planting are done in one operation. Herbicides are normally used to control weeds.

#### **STRIP-TILL**

It is considered strip-till when the crop is planted in a narrow, cultivated band, no more than one-third of the row width. The soil within the strips is disturbed by a planter that has been modified by adding multiple coulters and/or cleaners to remove more crop residue and create strips of bare or deep-tilled (using an in-row subsoil shank) soil. The field will have at least 60 percent of the soil surface covered by crop residue after planting.

Generally, strip-till is not used when row spacing is less than 30 inches.

#### **NO-TILL/STRIP-TILL PROCEDURES**

The percent of the soil surface covered will be in accordance with the definition of this practice. Residue will be from the previous crop, cover crop, or a combination of cover types.

In the case of no-till and strip-till, injecting or knifing-in anhydrous or liquid fertilizer prior to planting is permissible. See the Virginia Conservation Practice Standard, *Nutrient Management (Code 590)*.

Where pesticides are used, target them to specific problems. Pesticides will be used in accordance with the manufacturers' label. Refer to VPI and the local Extension Service recommendations. See the Virginia Conservation Practice Standard, *Pest Management (Code 595)*.

Specifications shall be recorded using approved certification sheets, job sheets, narrative statements in the conservation plan, or other acceptable methods. The following information will be recorded:

1. Field location: Tract number and field number
2. Acres of field
3. Cropping sequence
4. Residue type
5. Specify either no-till or strip-till. If strip-till, indicate the method and width of the tilled strip.
6. The percent of the soil surface covered immediately after planting

#### **OPERATION AND MAINTENANCE**

No operation and maintenance requirements have been identified for this practice.

## REFERENCES

1. Agricultural Handbook, 703, Predicting Rainfall Erosion by Water: A Guide to Conservation Planning with the Revised Universal Soil Loss Equation (RUSLE).
2. Virginia Pest Management Guide, published by the Virginia Cooperative Extension Service (Most current publication, i.e. current year).
3. National Agronomy Manual.
4. Agriculture Handbook 346, Wind Erosion Forces in the United States and Their Use in Predicting Soil Loss.
5. "Conservation Tillage – A Check List for U. S. Farmers", Published by CTIC, 10/96.
6. "Crop Residue Management to Reduce Erosion and Improve Soil Quality", USDA-ARS Conservation Research Report #39.
7. "Crop Residue Management to Reduce Erosion and Improve Soil Quality - Appalachia and Northeast", USDA-ARS Conservation Research Report #41.
8. Virginia Conservation Practice Standards *Cover Crop (340), Nutrient Management (Code 590), Pest Management (Code 595)*.

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**Approved Practice Narratives**

(Acre)

**CODE 329A**

329A D1 Residue Management, No-till/Strip-till: Plant all crops using no-till planting methods. Leave at least 60% of the soil surface covered at the time of planting with the residue of the previous crop or the cover crop.

329A D2 Residue Management, No-till/Strip-till: No-till methods will be used to plant row crops and grasses at least every other year. The second year of row crops may be planted using any tillage type. When no-till methods are used, leave at least 60% of the soil surface covered at the time of planting with the residue of the previous crop or the cover crop.

329A D3 Residue Management, No-till/Strip-till: No-till planting methods will be used for all row crops. Any tillage type may be used for planting small grains or grasses. For the no-till row crops, leave at least 60% of the soil surface covered at the time of planting with the residue of the previous crop or the cover crop.

329A D4 Residue Management, No-till/Strip-till: All row crops will be planted using no-till methods. (If weed pressures or diseases need to be controlled with conventional tillage, plowing may occur no more than once every three years.) For the no-till operation, leave at least 60% of the soil surface covered at the time of planting with the residue of the previous crop or the cover crop.

329A D5 Residue Management, No-till/Strip-till: All row crops will be planted using no-till planting methods. Leave at least 60% of the soil surface covered at the time of planting with the residue of the previous crop or the cover crop.

329A D6 Residue Management, No-till/Strip-till: Plant grasses and/or legumes using no-till planting method when renovating these pasture/hayland field(s). Leave at least 60% of the soil surface covered at the time of planting with the residue of the previous crop or the cover crop.

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